AGE DETERMINATION OF POUCH YOUNG AND JUVENILE KANGAROO ISLAND WALLABIES.

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SUMMARY

Repeated measurement of head, leg and foot lengths were made during the development of young Kangaroo Island wallabies (*Protemnodon eugenii*) of known age. The measurements were used to construct age regressions. Size was fairly closely correlated with age until the young were 320 days old but thereafter it had little value for age determination. The reliability of using the regressions to determine the age of young wallabies has been tested by using them to estimate the age of 14 young of known age. The largest error between the estimated and actual age of the young was about 5%.

Growth proportions of captive and field-reared young were compared and these were found to be similar until the young were about 350 days old.

INTRODUCTION

Several studies made on the growth rate of marsupial young in the pouch have shown that the age of young captured in the field can be accurately estimated by comparing their body measurements with those of captive young of known age (Shield and Woolley, 1961; Sadleir, 1963; Sharman, Frith and Calaby, 1964). A study on the ecology of the Kangaroo Island wallaby (*Protemnodon eugenii* Desmarest) living in Flinders Chase, Kangaroo Island, required a method for accurately determining the age of pouch young and juvenile wallabies captured in the field (Andrewartha and Barker, 1969). For this reason the growth of captive pouch young was studied and the reliability of using these measurements to determine the age of captive pouch young was assessed. The present study also examines the validity of applying these measurements to fixing the age of young Kangaroo Island wallabies in the field.

METHODS

During this study a domestic colony of Kangaroo Island wallabies was maintained in the Zoology Department, University of Adelaide. Details of animal husbandry are reported by Murphy (1970).

During the breeding season (January-July), the pouch of each female was examined daily until the birth of a young; the young were subsequently measured each week until they were about one year old. Yearlings were measured once a fortnight because of their slow growth rate. A total of 16 young were observed throughout the study but at any one time only seven young were measured.

The lengths of the head, left foot and left leg were measured in the manner indicated by Sharman et al. (1964). Vernier callipers were used to measure head and foot lengths of all the animals and the leg length of pouch young, while a steel tape measure was used to measure leg lengths of older animals. Fourteen of the young were weighed at intervals throughout the study; most of them were weighed several times. They were weighted on a variety of balances since no one balance covered the range of their weights.

Until they were 100 days old, the young were removed from the pouch and measured while still attached to the teat. Older pouch young were detached from the teat and measured. During measurement of the young, the mothers were restrained in jute sacks; no young were lost through the handling of the mothers.

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Juveniles and yearlings were restrained in jute sacks while their body parts were being measured.

Both operators measured the young every time and the average of the two estimates was taken to the nearest 0·1 mm. with the callipers and to the nearest 0·5 mm. with the tape measure. Weights were recorded to the nearest 0·1 g.

Before regressions calculated for young wallabies reared in the laboratory can be used to age young in the field, it is necessary to establish that wallabies in the laboratory and the field have the same growth proportions. For this purpose 87 young wallabies were collected at different times of the year in Flinders Chase, Kangaroo Island and were measured and weighed by one of us (C.M.) in the same way as the laboratory-reared animals.

RESULTS

The measurements made on laboratory-reared young aged 3-450 days are presented as regressions of age versus head length, leg length and foot length (Figures 1, 2 and 3).

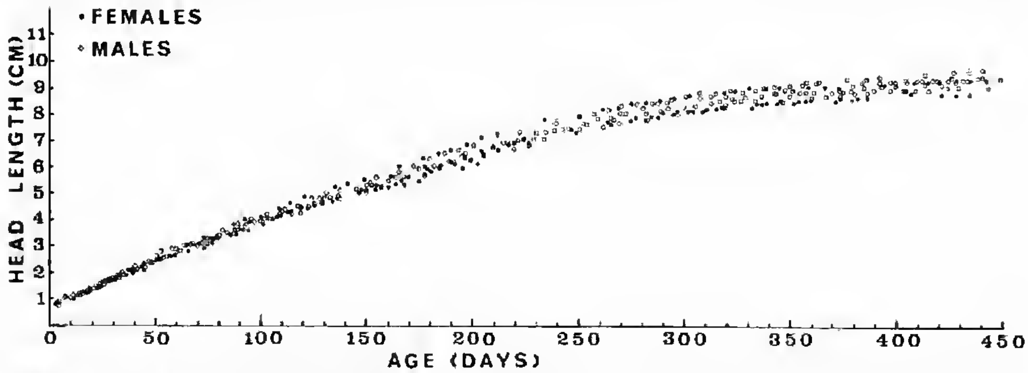

Fig. 1. Regression of head length on age for Kangaroo Island wallabies aged 3-450 days.

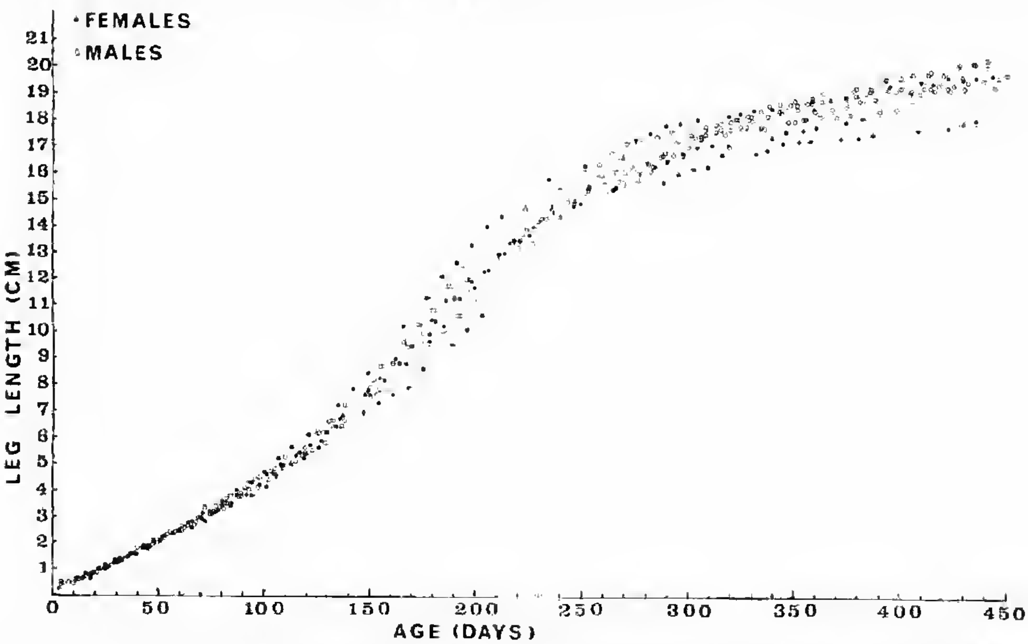

Fig. 2. Regression of leg length on age for Kangaroo Island wallabies aged 3-450 days.

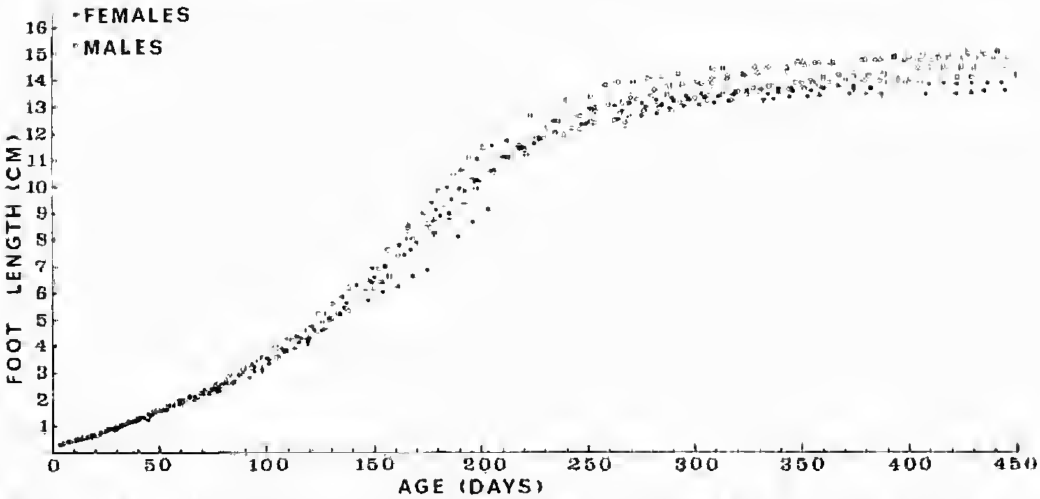

Fig. 3. Regression of foot length on age for Kangaroo Island wallabies aged 3-450 days.

The regressions show no marked differences in the growth rate of young male and female wallabies up until the time they leave the pouch permanently at 245-270 days. From this time the regressions for male and female young begin to diverge, the males being on average larger than the females.

Inspection of the three regressions shows a considerable scatter of points, much of which is due to the difficulty of making accurate measurements on the young. An age estimation based on a single body measurement could therefore be subject to a greater error than an estimation based on all three body measurements.

A series of measurements were also made on 14 young of known age which were not included in the regressions. Table 1 shows the measurements of these young, together with their ages as estimated from the three regressions, and their actual ages.

TABLE 1

Measurements of young Kangaroo Island wallabies of known age, not included in the growth regressions, and the ages of these young estimated from the regressions.

Reference Number and Sex	Lengths (cm.)*			Estimated Age (Days)†	Actual Days (Days)
	Head	Leg	Foot		
74(?)	0·87 (4)	0·41 (5)	0·33 (5)	5	3
1 ♂	1·12 (12)	0·61 (12)	0·41 (8)	11	10
2 ♀	1·22 (15)	0·69 (14)	0·55 (14)	14	16
3 ♂ (?)	1·29 (17)	0·78 (17)	—	17	17
14 ♂	1·67 (27)	1·15 (26)	0·84 (27)	27	26
67 ♀	2·00 (36)	1·42 (34)	1·08 (35)	35	36
595 ♂	2·78 (58)	2·45 (57)	1·84 (59)	58	59
14P ♂	3·77 (92)	4·03 (91)	3·18 (95)	93	94
84 ♀	4·35(115)	5·31(116)	4·15(114)	115	111
77 ♀	4·42(118)	5·50(120)	4·34(118)	119	123
594 ♀	4·50(121)	5·83(124)	4·90(126)	124	129
76 ♀	5·45(162)	8·74(164)	7·55(166)	164	163
94 ♀	5·79(174)	9·76(176)	8·47(177)	176	185
SE ♂	6·45(199)	11·80(197)	10·74(203)	200	197

* Estimated ages from each measurement are in parentheses.

† Based on average of ages estimated from each measurement.

It can be seen that the largest actual error in age estimations for any of the young was nine days when the estimate was made from all measurements (young no. 94 ♀, Table 1). This represents an error of about 5%.

Figures 1, 2 and 3 show that size is fairly closely correlated with age until the young are 320 days old, but thereafter it has little value for age determination.

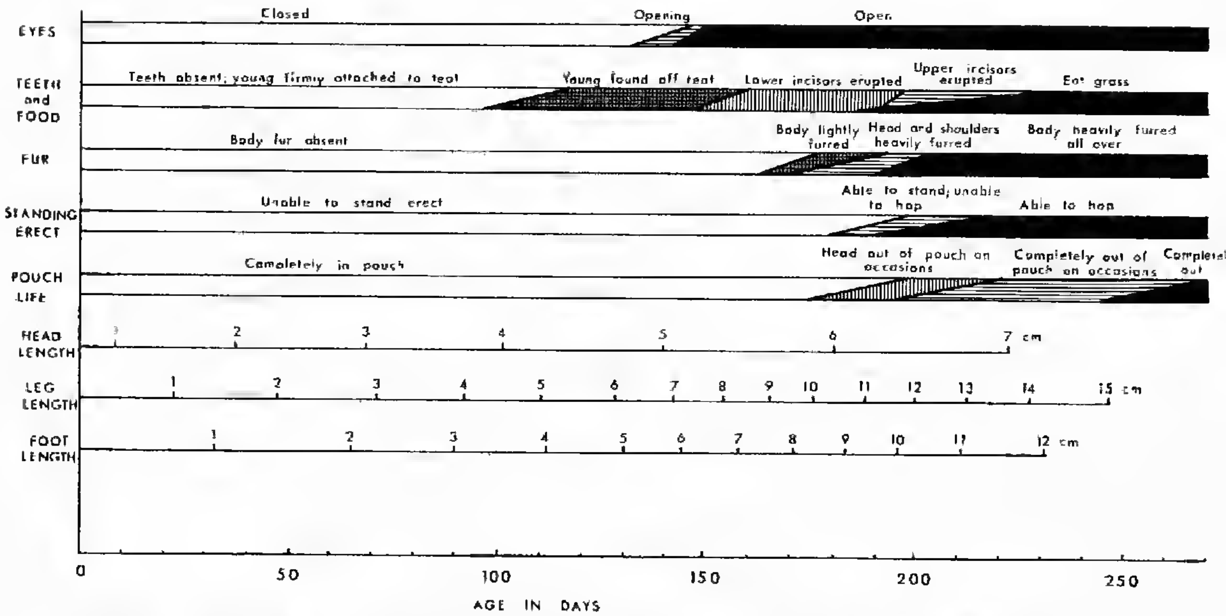

Fig. 4. Development of body characters and changes in body proportions of Kangaroo Island wallabies aged 0-270 days. The legend is as stated on the figure. The sloped lines indicate the range of ages over which the character develops.

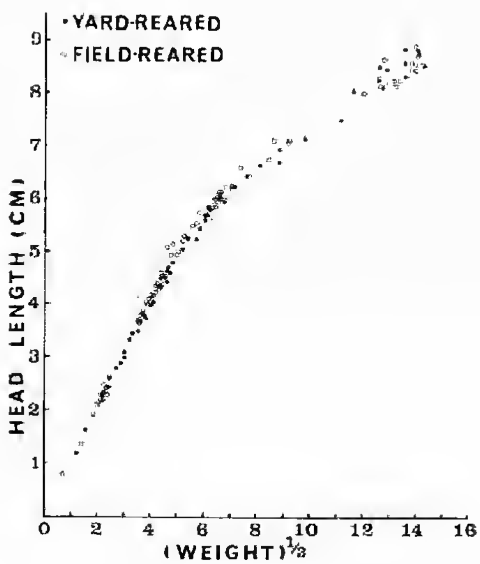

Fig. 5. Regression of head length on cube root of body weight of young Kangaroo Island wallabies reared in captivity or in the field.

During the study some observations were made on the development of various body features of the young, and changes in their body proportions as they grew older were also recorded. These observations are presented diagrammatically in Figure 4.

Figures 2 and 4 show that the leg has the longest period of rapid growth and it appears that in using leg length as a criterion for age, if males and females are considered separately, an error of between 20 and 45 days might occur when aging young 320 days old.

Figures 5-7 present the regressions of cube root of weight (condition) against the lengths of head, leg and foot (age) for laboratory- and field-reared wallabies.

These regressions show no marked differences in the growth proportions of laboratory- and field-reared young up to an age of about 350 days.

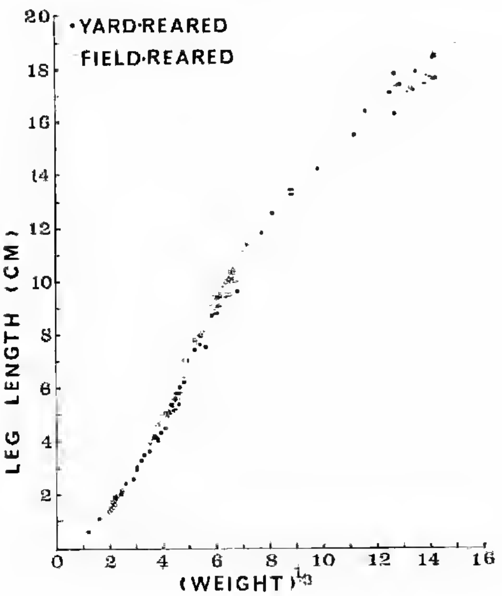

Fig. 6. Regression of leg length on cube root of body weight of young Kangaroo Island wallabies reared in captivity or in the field.

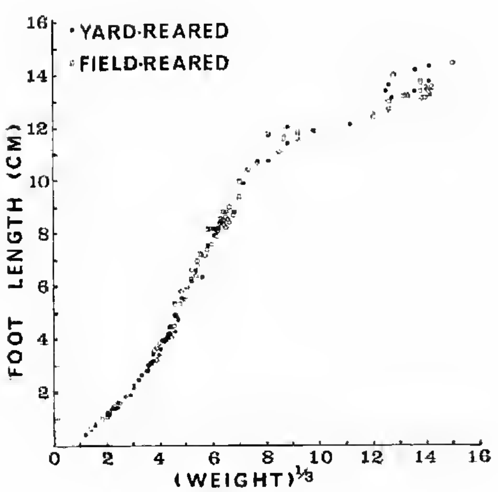

Fig. 7. Regression of foot length on cube root of body weight of young Kangaroo Island wallabies reared in captivity or in the field.

DISCUSSION

The growth rate of young macropods in the field is extremely difficult to estimate. Shield and Woolley (1961) found that growth proportions of compound- and field-reared quokkas did not differ significantly, and so considered that the growth rates of field and captive animals were probably similar.

A comparison of growth proportions between pouch young of euros from the field and from laboratory yards was carried out by Sadleir (1963). He found that there was generally little difference between the condition of young from the field and from the yards and concluded that nutrition in the field was never poor enough to restrict the growth of the pouch young. Sharman *et al.* (1964) drew a similar conclusion for pouch young of the red kangaroo. They suggested that the comparatively stable environment of the pouch led to an "all or none" growth phenomenon and that the body measurements of the young provide a reasonably accurate indication of their age.

The present study shows that the growth proportions of laboratory-and field-reared Kangaroo Island wallabies do not differ significantly in young aged less than 350 days. This is despite the observation that adult female wallabies in the field may be short of nitrogen and water at certain times of the year (Murphy, 1970), while laboratory-reared females were never short of food and water. It seems that the level of nutrition of female wallabies in the field is generally adequate so that growth of the pouch young is not restricted. It is possible that maternal malnutrition may severely affect the growth of the young, but it seems that this rarely occurs in the field.

This study thus shows that size, as estimated from body measurements, provides a reliable indication of the age of laboratory- and field-reared Kangaroo Island wallabies until they are 320 days old.

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REFERENCES

ANDREWARTHA, H. G., and BARKER, S., 1969. Introduction to a study of the ecology of the Kangaroo Island wallaby, *Protemnodon eugenii* (Desmarest), within Flinders Chase, Kangaroo Island, South Australia. Trans. R. Soc. S. Aust. 93: 127-133.

MURPHY, C. R., 1970. Haematological studies on the Kangaroo Island wallaby, *Protemnodon eugenii* (Desmarest). Thesis (unpublished), Barr Smith Library, University of Adelaide.

SADLEIR, R. M. F. S., 1963. Age estimation by measurement of joeys of the euro *Macropus robustus* Gould in Western Australia. Aust. J. Zool. 11: 241-49.

SHARMAN, G. B., FRITH, H. J., and CALABY, J. H., 1964. Growth of the pouch young, tooth eruption and age determination in the red kangaroo, *Megaleia rufa*. C.S.I.R.O. Wildl. Res. 9: 20-49.

SHIELD, J. W., and WOOLLEY, P., 1961. Age estimation by measurement of pouch young of the quokka (*Setonix brachyurus*). Aust. J. Zool. 9: 14-23.